REPORT OF

Fortieth Annual

DATE GROWERS' INSTITUTE

April 27, 1963

HELD IN

COACHELLA VALLEY

CALIFORNIA

Volume 40

Published by the

DATE GROWERS' INSTITUTE

Coachella Valley, California

September, 1963

The DATE GROWERS' INSTITUTE is the official educational instrument of the date industry. Its goal is the dissemination of information on date growing, handling, marketing and research. The INSTITUTE was organized in 1924 and is supported by memberships and publication of the proceedings of the annual meetings. Any or all of these publications are available, including a complete Index. Direct all inquiries to

MRS. T. R. BROWN, Secretary
Route 2, Box 81
Thermal, California

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INTRODUCTION

R. W. Hodgson

Ladies and Gentlemen:

Farm Advisor Halsey's kind and generous introduction is greatly appreciated and I feel both flattered and somewhat embarrassed.

I am grateful to the committee in charge for the privilege, honor and pleasure of presiding at the opening session of this, the 40th Annual Date Institute. I believe that it was my good fortune to have attended the First Date Institute and I recall that during its early history I enjoyed attending a number of them. Beginning in 1933 however, my teaching obligations at the University during the spring semester conflicted with the Institute date and hence I was prevented from regular attendance at these interesting and informative sessions.

As chairman of the opening session and on behalf of the Committee, it is my pleasant duty to extend a hearty welcome to all and especially to such visitors as may not have attended previous Date Institutes. We hope to make your acquaintance and that you will find the program both interesting and helpful.

I enjoy many pleasurable recollections — extending back for some 45 years — associated with visits to the date growing areas of California and Arizona and to some other parts of the world. My first trip to the Coachella Valley was in the summer of 1917 and I have most vivid memories of a change of tire in the sandy Whitewater wash above Palm Springs and of the 124° temperature reading on our arrival at the Southern Pacific Station hotel where we stayed that night, with the thermometer still above 100° at 10:00 p.m. Among the date gardens I remember visiting that trip were those at the Durbrow, Holmes, Popenoe, and Johnson ranches and of course the Government Date Garden which even then had an impressive experimental program.

Beginning in 1930 with visits to some of the oases of southern Tunisia and eastern Algeria, it has been my good fortune during the past 30 years to see something of date culture in Morocco, Egypt, and the Indus Valley of the Punjab in India (now West Pakistan). The most recent of such visits was to the horticultural research station at Abohar in the western Punjab last year where a variety collection was established only a few years back with offshoots from the Coachella Valley provided by the Rockefeller Foundation. All the varieties have successfully been established and most of the young palms are growing well.

From my travels and observations, supplemented by reports from former students and contacts with horticulturalists abroad, I can personally attest to the fact that much the greater part of the science and technology employed in modern date culture, handling, and processing originated within a radius of less than 50 miles from where we are now assembled—namely at the Government Date Garden and in the commercial gardens and packing plants of the Coachella Valley. Additionally, there cannot be the slightest doubt that the past half-century has witnessed here more scientific and technological progress than has occurred in all previous history. And finally, it should be emphasized that the Proceedings of this Institute constitute an unique and invaluable repository of research and technology in date culture, handling, and processing—the best known and authoritative source of information throughout the date-growing world.

As usual the Committee has prepared an excellent and interesting program with which we will now proceed.

COMPARATIVE YIELDS OF DEGLET NOOR DATE PALMS FERTILIZED WITH MANURE OR AMMONIUM NITRATE

J. R. Furr and T. R. Brown[1]

Most commercial date gardens in the Coachella Valley are fertilized fairly regularly with inorganic fertilizers such as anhydrous ammonia, ammonium sulfate, or ammonium nitrate, with animal manures, or with a combination of inorganic and organic materials.

Deficiency of mineral nutrients other than nitrogen has not been demonstrated in Coachella Valley date palms, and a study of the mineral composition of date leaf samples taken in a survey of Coachella Valley date gardens (Reuther 1948) indicated that widespread deficiency of none of the major elements existed. Manure has been applied to dates primarily for its nitrogen content. When manure alone is depended upon to provide adequate nitrogen for dates, so much manure is needed that large amounts of potash and phosphorus and small amounts of minor elements are also added to the soil. The effect of these other substances upon dates grown on Coachella Valley soils is not known. Leaching of nitrate may, of course, readily occur in sandy soils supplied with irrigation water greatly in excess of the needs of the palms, or under certain conditions large amounts of ammonia fixed in the surface layers of soil may be lost into the air by volatilization.

Current judgment of the relative merits of manure and inorganic nitrogen compounds as fertilizers for dates is based largely upon observations of commercial gardens rather than upon results from experimental plots of replicated treatments. A recent attempt was made to learn how growth of non-bearing palms was affected by the application at several rates of nitrogen from ammonium nitrate, from manure, and from a combination of the two fertilizers (Furr & Armstrong 1960). Growth of trees under the different treatments was not significantly different; however, extreme variability of the young palms may have prevented detection of differential effects.

Most fertilizer tests with dates in the Coachella Valley have presented difficulties because of the great variability of date palms and soils (Furr & Armstrong 1957). The results of these tests indicated that further fertilizer tests would require fairly large numbers of relatively uniform trees unless very large differences between treatments are expected. The block of Deglet Noor palms in the T. R. Brown Garden used in the present test seemed to meet this requirement. The object of the experiment reported here was to compare the influence of equal annual applications of nitrogen derived from two materials — ammonium nitrate and cattle manure — on the yields of Deglet Noor date palms.

MATERIALS AND METHODS

Experimental plots were established in a relatively uniform block of Deglet Noor palms growing on Coachella very fine sand. The trees were 10 years old in the spring of 1952 at the start of the test. The treatments were as follows:

1. Ammonium nitrate—6 lbs. of nitrogen per tree per year from ammonium nitrate, applied in 3 equal amounts (2 lbs. of N per tree) just

[1]*Crops Research Division, Agricultural Research Service, U. S. Dept. of Agriculture, Indio, California, and T. R. Brown Date Garden, Thermal, California.*

before the weeds were cultivated into the soil in spring, summer, and fall.

2. Manure—approximately 6 lbs. of nitrogen per tree per year from cattle-feed-lot manure, applied in winter or early spring at a rate of about 10 tons per acre and disced under.

The amount of manure applied was based on the assumption that it contained a minimum of 1.5 percent nitrogen, as stated by the supplier. Analysis of manure samples taken the first year of the test from each truck load applied indicated that the nitrogen content usually was somewhat over 1.5 percent, but in other years this may not have been true.

There were 9 randomized plots under each treatment. The plots consisted of 4 record trees each and were guarded on all sides by border trees; that is, the plots were 6 trees long with border rows between. The entire space between experimental trees and border trees was fertilized at the rate assigned to the experimental trees. The fruit was harvested from the experimental trees as part of the regular harvesting operations of the garden. Usually three pickings per season were made. The average yield per tree of each plot was estimated from box counts and the average net weight per box determined from weighing sample boxes from each picking.

RESULTS

Yields were recorded from 1953 to 1961, but the 1960 yield record was lost. Yield records in 1952 were omitted because treatments applied after the inflorescences were formed would probably not have affected that year's yields. The average yields per tree of all test trees show an upward trend until 1957, when the trees were 15 years old (Table 1) and apparently reached full bearing. This estimate agrees fairly well with the 13 years of age at which the adjoining block of older Deglet Noor palms on the Brown Garden reached full bearing (Brown 1957). The average yields under both treatments were highly variable and did not show a significant difference between treatments until 1957, the sixth year of treatment (Table 2).

In 6 out of 8 years of record the average yield of trees that received ammonium nitrate was greater than that of trees that received manure but significantly so in only 1957 and 1959. The average yield for the 8 years of record of trees that received ammonium nitrate was significantly greater than that of trees which received manure. This difference, 22 pounds per tree, was about 10 percent of the yield of the trees that received manure.

Table 1. Relation of average yield per tree of Deglet Noor dates to tree age.

Year	Tree age (years)	Yield 1[1] (pounds)
1953	11	191 a
1954	12	186 a
1955	13	205 a
1956	14	223 ab
1957	15	276 c
1958	16	208 a
1959	17	258 bc
1961	19	252 bc

[1]Values not followed by the same letter are significantly different at the 5% level.

Table 2. Relation of average yield per tree of Deglet Noor dates to fertilizer treatment.[1]

Year	Manure	Ammonium nitrate
1953	200 a-c	182 ab
1954	178 a	193 a-c
1955	203 a-d	207 a-d
1956	200 a-c	247 cd
1957	247 cd	306 f
1958	213 a-d	204 a-d
1959	227 a-d	290 ef
1961	241 b-d	262 de
8-yr. av.	214 a	236 b

[1]Values not followed by the same letter or letters are significantly different at the 5% level. Compare yearly and 8-year averages separately.

SUMMARY AND CONCLUSIONS

To compare the effect on yield of fertilizing dates with manure and ammonium nitrate, we applied the two materials yearly for 10 years in amounts that supplied approximately 6 pounds of nitrogen per tree to different field plots of the variety Deglet Noor growing on a very fine sand in the Coachella Valley, California. In the 8 years of yield records, the average yield of trees that received ammonium nitrate was significantly greater (10 percent) than that of trees that received manure.

In considering nitrogenous fertilizers for dates, the grower should take into account the lower effectiveness and greater cost of application per pound of nitrogen from manure as compared with nitrogen from inorganic sources.

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EFFECTS OF DIFFERENT SALTS AND SALT CONCENTRATIONS ON THE GERMINATION AND SUBSEQUENT GROWTH OF DEGLET NOOR DATE SEEDS

By A. A. Hewitt

Crops Research Division, Agricultural Research Service
U. S. Department of Agriculture
U. S. Date Field Station, Indio, California

INTRODUCTION

Although dates have been listed as ultraresistant to salinity in the soil solution by Grillot (2), and Khudairi (3) has germinated date seeds in petri dishes in concentrations up to 2% NaCl solution, little has been done on the germination of seeds and the relative growth of date seedlings in different salt solutions. This experiment was conducted to gain information on the effect of five salt combinations, each at three concentrations, on the percent germination of seeds and subsequent growth of date seedlings.

MATERIALS AND METHODS

In early June 1962, 25 seeds of the Deglet Noor variety were planted in each of 64 one-gallon pots in a peat moss-vermiculite mixture. Each of four pots received well water[1], sodium chloride (NaCl), calcium chloride ($CaCl_2$) and sodium sulphate (Na_2SO_4) or combinations of these salts at the following concentrations:

Salt concentration in ppm.			
NaCl	10,000	20,000	30,000
$CaCl_2$	13,400	27,000	40,000
Na_2SO_4	12,730	25,650	38,000
NaCl+ $CaCl_2$	5,000+ 6,725	10,000+ 13,625	15,000+ 20,000
Total	11,725	23,625	35,000
NaCl+ Na_2SO_4	5,000+ 6,390	10,000+ 12,950	25,000+ 19,000
Total	11,390	22,950	34,000

These solutions were all to have been at concentrations 10,000, 20,000 and 30,000 ppm, but because of uncertainty as to the water of crystalization or the moisture content of the $CaCl_2$ and Na_2SO_4 salts, preparation was based on conductivity determinations. Because the conductivity cell was faulty, solutions of the concentrations listed were prepared, and this error was not discovered until near the end of the experiment. Hereafter, for convenience, reference will be made to the approximate concentration—10,000+ 20,000+ and 30,000+ ppm—rather than to the actual.

From the start of the experiment until emergence of the first seedlings the pots were kept covered with polyethylene and irrigated with water or salt solutions two or three times a week as needed. After the seedlings had emerged, the pots were irrigated daily with these solutions in sufficient quantity to flush out all previously applied salt. No other mineral nutrients were added.

The experiment was continued until September 19, when it was assumed that all viable seed had germinated. The seedlings were counted, length of top and root growth measured and the tops and roots were separated into samples. The samples were dried in a forced-air oven at 65° C, ground in a Wiley mill and analysed for chloride by the method of Brown and Jackson (1) with the following modifications: (1) a silver-silver chloride electrode (2) Beckman model 96 Zeromatic pH meter and (3) 600 millivolt endpoint. Sulfate was not determined because of insufficient sample size.

RESULTS

There was little difference in the number of seeds which germinated in the 10,000+ and 20,000+ ppm treatments (Table 1). In some instances, the number in the 30,000+ ppm treatments was reduced. In the 30,000+ ppm treatments, germination was assumed if the cotyledons had emerged. Most of the cotyledons were burned or killed by the high salt concentrations after they had grown only a few millimeters.

Differences in length of growth of the tops and roots can be seen in Table 2. The check, which was irrigated with well water, attained the greatest height and was significantly different from all other treatments.

Table 1. Influence of concentration of salt solution on percentage germination of Deglet Noor seeds.

Salt	Percent Germination 10,000+ (ppm)	20,000+ (ppm)	30,000+ (ppm)
NaCl	90	86	77*
$CaCl_2$	88	96	62
NaCl $CaCl_2$	94	93	68
Na_2SO_4	81	91	96
NaCl Na_2SO_4	91	92	87
Check	81		

*Number from which cotyledons emerge, and were then burned by salt.

Table 2. Influence of kind of salt and concentration of salt solution on top and root growth and top to root ratio of Deglet Noor seedlings.

Salt	Conc. (ppm)	Top (cm.)	Root (cm.)	Ratio top/root
NaCl	10,000	21.5 d*	20.5 de	1.05 a
$CaCl_2$	13,400	20.9 d	19.3 d	1.10 a
NaCl $CaCl_2$	11,725	23.9 e	20.3 de	1.18 a
Na_2SO_4	12,730	20.5 d	19.1 d	1.08 a
NaCl Na_2SO_4	11,390	22.7 de	21.9 e	1.04 a
NaCl	20,000	3.5 a	5.0 a	.71 b
$CaCl_2$	27,000	7.1 b	8.2 b	.87 b
NaCl $CaCl_2$	28,625	10.9 c	13.5 c	.81 b
Na_2SO_4	25,650	4.2 a	9.1 b	.48 c
NaCl Na_2SO_4	22,950	3.9 a	10.4 b	.37 c
Check		31.1 f	28.5 f	1.09 a

*Means not followed by the same letter differ at the 5% level.

[1] $EC \times 10^3 = 0.32$ *millimhos/cm. at* 25°C.

The top growth of seedlings in the 10,000+ ppm $NaCl_2$ + $CaCl_2$ treatment was significantly greater than that of seedlings in three of the other treatments (NaCl, $CaCl_2$ and Na_2SO_4) but not significantly greater than the NaCl + Na_2SO_4 treatment. In the 20,000+ ppm series, tops of plants in the NaCl + $CaCl_2$ treatment attained the greatest height and were significantly different from the rest of the treatments. Only three seedlings emerged in the 30,000+ ppm series. These were in the NaCl + Na_2SO_4 treatment, and attained an average height of 4.3 cm.

Root growth like top growth was inhibited more by the 20,000+ ppm treatments than by the 10,000+ ppm treatments. Roots in the NaCl+Na_2SO_4 10,000+ ppm treatment were significantly longer than those in the Na_2SO_4 and $CaCl_2$ treatments. Roots in the NaCl+$CaCl_2$ 20,000+ ppm treatments were like the tops in this treatment in having the longest growth and being significantly different from all other roots in the 20,000+ ppm treatments.

The decrease in top and root growth as the concentration of salt increased was accompanied by a shift in the top-root ratio (Table 2). The seedlings growing in the 10,000+ ppm salt solutions had tops which were longer than their roots, but the seedlings growing in the 20,000+ ppm salt solutions had just the reverse. This was very marked with plants in the 20,000+ppm Na_2SO_4 and NaCl+Na_2SO_4 treatments.

The chloride contents of both the tops and the roots were in general higher for the 20,000+ ppm series than for the 10,000+ series (Table 3). The chloride content of the tops in the 10,000+ ppm NaCl+$CaCl_2$ treatment was, however, not significantly different from that of the tops in the 20,000+ppm $CaCl_2$, NaCl+$CaCl_2$ and NaCl+Na_2SO_4 treatments. Also, there was no significant difference between chloride contents for the tops in 10,000+ppm and 20,000+ ppm $CaCl_2$ treatments. The chloride content of the tops in the 20,000 ppm NaCl treatment was 7.07% and significantly different from the tops in all other treatments.

The chloride content of roots was highest in the NaCl treaments in both the 10,000 ppm and 20,000 ppm series. In fact, the chloride content of the roots in the 10,000 ppm NaCl treatment was not significantly different from that of plants in the $CaCl_2$ and NaCl+$CaCl_2$ 20,000+ ppm treatments.

Table 3. Influence of kind of salt and concentration of salt solution on the chloride content of the tops and roots of Deglet Noor Seedlings.

Salt	Conc. (ppm)	Chloride Content (%) Tops	Roots
NaCl	10,000	2.60 b*	7.13 d
$CaCl_2$	13,400	4.73 d	6.44 c
NaCl $CaCl_2$	11,725	3.98 c	6.20 c
NaCl Na_2SO_4	11,390	2.19 b	5.53 b
NaCl	20,000	7.07 e	9.53 e
$CaCl_2$	27,000	4.48 cd	7.42 d
NaCl $CaCl_2$	23,625	3.84 c	7.65 d
NaCl Na_2SO_4	22,950	3.99 c	6.34 c
Check		1.36 a	1.42 a

*Means not followed by the same letter differ at the 5% level.

DISCUSSION

The results obtained in this experiment were in general what was expected, that is, as the concentration of salts increased, uptake increased and growth decreased. However, the effects of the different salts on growth and uptake and the concentration at which growth occurred were somewhat unexpected. Khudairi (2) reported germination completely inhibited by concentrations of 2% (20,000 ppm) NaCl. In the present experiment 86% of the seeds in 20,000 ppm NaCl germinated, as did similar or larger percentages in 27,000 ppm (2.7%) $CaCl_2$, 25,650 ppm (±2.6%) Na_2SO_4, 23,625 ppm (±2.4%) NaCl+$CaCl_2$, and 22,950 ppm (±2.3%) NaCl+Na_2SO_4. Also 3% of the seeds in 34,000 ppm (3.4%) NaCl+Na_2SO_4 germinated and grew. This is a concentration near that of sea water (3.5%), although sea water is of different salt composition.

Although plant growth at the 10,000+ ppm concentration was inhibited as compared to that of check plants, there was little difference between the different salts as to their effects on the length of top and root growth or the ratio of top to root growth. This was not the case with plants in the 20,000+ ppm treatments. Along with greatly reduced growth, a change in top-root ratio occurred, especially in seedlings receiving sulfate. In these cases the high concentration of sulfate apparently depressed top growth. The reason for this is not known. The greatest growth in the 20,000+ ppm series was attained by plants in the NaCl+$CaCl_2$ treatment. Since the amount of chloride available to the plant was similar in the NaCl+$CaCl_2$ treatment and the NaCl and $CaCl_2$ treatments, the greater growth must have been made because of an antagonism between the Ca and Na ions. This would result in a balance between the two ions. Unfortunately sample size was insufficient for cation analysis to substantiate this assumption.

As the concentration of salts increased from 10,000+ to 20,000+ ppm an increase occurred in chloride content of the roots but not of all the tops. The tops of plants treated with 10,000+ or 20,000+ ppm of $CaCl_2$ or NaCl+$CaCl_2$ had the same chloride content regardless of level of salt. Also, although the roots increased in chloride content, the increase resulting from doubling the salt concentration in the irrigation solutions was small. Apparently roots are selective in their uptake of chloride. Although the concentration of chlorides in the irrigation solution of the NaCl+Na_2SO_4 treatment was just half that of the other chloride treatments, the amount of chloride found in the tops of plants given this treatment in the 10,000+ ppm series was the same as that of plants in the NaCl treatment and in the 20,000+ ppm series the same at the NaCl+$CaCl_2$ treatment.

The abnormally high chloride content in the roots and tops of the 20,000 ppm NaCl treatment may be due to sodium toxicity or a combination of sodium and chloride toxicity. The sodium and/or sodium chloride may be toxic to the root, causing more uptake by the root and therefore greater accumulation by the tops.

Probably one of the hardest things to explain is the drastic decrease in growth of plants in the 20,000+ ppm series as compared to those in the 10,000+ ppm series in view of only slightly increased chloride content in both tops and roots of the former. This may be due to near toxic levels of anions and cations being reached, that is, levels in the roots which inhibit the growth processes; or it may be due to the osmotic pressure of the culture solution being too high to permit normal uptake and absorption of water and other nutrients. Further work is needed.

SUMMARY

Deglet Noor date seeds were planted in a mixture of peat moss and vermiculite and irrigated with solutions containing the following salts: NaCl, $CaCl_2$, Na_2SO_4, NaCl+$CaCl_2$ and NaCl+Na_2SO_4 at concentrations of 10,000+, 20,000+, and 30,000+ ppm. It was found that:

(1) Percent germination was reduced only at 30,000+ ppm.

(2) Growth was decreased slightly by the 10,000+ ppm treatment, drastically by the 20,000+ ppm treatment and prevented by the 30,000+ ppm treatments except for 3 seedlings in

the $NaCl+Na_2SO_4$ 34,000 ppm treatment.

(3) Increased uptake of chlorides by the roots was not necessarily accompanied by increased chloride concentration in the tops.

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PROGRESS IN MECHANIZATION OF DATE HARVESTING

By
G. K. Brown
Agricultural Engineer
U. S. Department of Agriculture
University of California
Davis, California

and

R. M. Perkins
Assistant Specialist Agricultural Engineering
University of California
Los Angeles, California

A report on the progress in the mechanization of date harvesting was presented to the Institute by the above engineers who are conducting a research project on the subject. Their report evaluated the several harvesting systems used by the industry during the past season and reviewed the various methods of mechanically separating dates from the bunch.

The progress in mechanization reported by the two engineers was indeed impressive and a report covering it would have been most timely and interesting. However, inasmuch as their work was not final, they requested that the preliminary report not be published at this time. Should any grower or interested person have any questions regarding the work that is being done on the subject of mechanization of date harvesting, they are invited to contact the Date Administrative Committee under whose sponsorship the mechanization research was initiated.

Billy J. Peightal, Manager

Date Administrative Committee

SOME ASPECTS OF THE DATE PROCESSING INDUSTRY IN FRANCE

By V. P. Maier

Fruit and Vegetable Chemistry Laboratory[1]
Pasadena, California

Of all the date packing countries of the world the only two which pack primarily the Deglet Noor variety are the United States and France. The dates packed in France are grown in Algeria and Tunisia and shipped to Marseille for processing and packing. Deglets are also packed in Algeria and Tunisia, however, the main varieties grown are the Ghars in Algeria and the Fatiimi in Tunisia (1). Deglets whether packed in Algeria, France or Tunisia are marketed mostly in continental Europe, where their distinctive flavor and light color set the standard for quality.

Because of the well known reputation of the Deglet Noor dates marketed in Europe, I was very happy to have the opportunity to visit a date packing plant in Marseille last year. Roy W. Nixon, horticulturist at the U.S. Date Field Station in Indio, California, who is very well known throughout the world for his work on dates, was kind enough to arrange an invitation for me from one of the date packing plants in Marseille.

In general the plant was similar to date packing plants in California. The fruit is fumigated in Algeria and Tunisia after harvesting and shipped to Marseille in wooden boxes. The dates are similar in appearance to tree dried California Deglets, with a variety of maturity stages and sizes evident. At the time of my visit in early October, fruit from the previous season which had been carried-over in cold storage at 34°F. was being run. It was still quite light in color.

The steps used in processing the dates are similar to those used in California. The fruit is sorted into several maturity grades by women, washed by soaking and poured into wicker baskets where the excess water drains off. The baskets are stacked on carts which are rolled into a steam room for hydration. The rooms are about 15 feet square with a perforated steam pipe around the perimeter. The fruit remains in the hydrating room for a period ranging from one to twelve hours or more depending on its moisture content and maturity. The temperature of the room is between 160 and 167°F., considerably higher than the 140°F. maximum temperature used in California plants, yet the color of the fruit remains relatively light. This observation would indicate that Algerian and Tunisian Deglets are less susceptible to darkening during processing than California Deglets, however, without tests conducted under identical conditions definite proof is lacking. Factors such as final moisture content of the fruit, time of heating, actual fruit temperature, etc. have a profound influence on the rate of darkening of dates and may be responsible for the differences observed. On the other hand, differences in

[1] *A laboratory of the Western Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture.*

the chemical composition of the dates also may be involved. Climatic conditions and cultural practices could be responsible for differences in composition, particularly in the minor constituents. Unfortunately, no comparison of the detailed chemical composition of Deglet Noor dates grown in California and Algeria or Tunisia is available. There is, however, a report which shows that the application of excessive amounts of nitrogen fertilizer to date palms is associated with the production of dark, off-color, poor-textured fruit (2).

Following hydration the fruit is allowed to stand overnight to cool. Because of the close packing of the fruit in the baskets and the stacking of the baskets, the fruit probably remains warm enough to permit enzyme catalyzed sucrose hydrolysis and tenderization to occur during this cooling period. The day after hydration the dates are sorted into five size grades by hand and packed into a variety of cardboard and wooden boxes. No chemical preservatives are used to prevent microbial growth since their use is not permitted in France. However, microbial spoilage is not a problem because the high temperature used during hydration also pasteurizes the fruit and the final moisture content of about 22-23% is below that at which microbial growth occurs in dates. Also, the packaging materials used are permeable to water vapor and allow further loss of moisture and increased stability during storage and marketing.

SUMMARY

In summary, the processing operations in this plant in Marseille are generally similar to those used in the United States with two exceptions; namely, the use of higher hydrating temperatures and the absence of a need to use preservatives to prevent microbial spoilage. The Deglet Noor dates packed in Marseille appear to be less susceptible to darkening at high temperatures than California dates of the same variety although direct comparisons are lacking.

ACKNOWLEDGEMENTS:

The author would like to extend his appreciation to Mr. Dewarvrin and Mr. Maget of the Compagnie Des Oasis De L'Oued Rhir, Marseille, France for their cooperation and courtesy during his visit.

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EXPERIENCE IN CONVERSION TO NON-TILLAGE AND WEED CONTROL WITH OIL

Ben T. Laflin, Jr.
Date Grower, Thermal

I would like to start by telling you why the Mosquito Abatement District got into the weed oil business, and then tell you some of the effects of its use that I have observed.

The Mosquito Abatement District has two functions. One, is to control mosquitos, and this is comparatively easy. The second, is to control eye gnats. The Mosquito Abatement District is tax supported and at present has a 16c tax rate. The budget this year is about $350,000. It is governed by a board of seven directors, consisting of a representative appointed by each of the three incorporated cities in the area and representatives appointed by the Board of Supervisors from the four unincorporated areas.

A number of ways have been tried in the past by the district for controlling eye gnats. Many years ago big traps with rotten liver bait were used. Then about 10 years ago the district began using an insecticide, Aldrin, which was sprayed on the ground just before the farmer was ready to disk, so that it was incorporated into the soil where it killed the gnat larvae. After several years, the gnats developed resistance to Aldrin and we switched to DDT, which was also disked into the soil where it killed the gnat larvae. When first used about 6 years ago, the DDT applications killed 99% of the gnat larvae, but last year this effectiveness had decreased to 30%, so that it was no longer considered effective enough to continue its usage.

Fortunately, about 8 years ago, the district made arrangements with the University of California to have their Entomology Department at Riverside begin a research program on gnat control. We gave them a grant of $5,000.00 for each of the first and second years of the program and they put a very able entomologist, Dr. Mir Mulla to work on the program. Since then we have been able to get help through the State Legislature which has been putting $36,000 per year into this chemical control phase of the program. In addition to this, we have been able to get the biological control section of the Entomology Department at University of California at Riverside working on the problem. We initiated the biological control research program 2 years ago by giving the University a grant of $8,000.00 to start the program, and since that time, the amount has been increased to $30,000.00 per year from the State of California. Several gnat parasites have already been found, both here and in Puerto Rico, where Dr. Legner is now working. Next year he is to go to Peru. This is a tremendous research project and every possible avenue of gnat control is being explored. About 10% of the Department of Entomology at Riverside is working on the program and they have about 10 million dollars worth of equipment available to them. They say this is one of the most difficult problems they have had.

Eye gnats reproduce at a prodigious rate. As many as 8½ million gnats per acre may be produced in 3 weeks on land which has had a heavy cover crop turned under on it. The gnats lay their eggs in the soil, and the larvae which hatch from them feed on decaying organic material in the soil. The larvae grow best where green cover crops are turned under. The female gnat lays 40 to 100 eggs, and during warm weather it only takes about 3 weeks for one of these eggs to develop into an adult.

This brings us to where we are at present with regard to eye gnat control. Both of the insecticides we were using have become ineffective. Thousands of other chemicals have been checked and there are at present only two others that are reasonably effective. However they are both high priced and only remain effective for about six months. The best of these two costs about $20.00 per acre, the other $50.00 per acre applied. We are using some of this material (Trithion) in selected areas where we can't obtain control by weed oil spraying. The research done by the University has shown that by far our most effective eye gnat control is non-cultivation, obtained by the use of weed oil sprays, or in some cases by the use of other chemicals such as Monuron in asparagus. *Non-cultivation give almost* 100% *eye gnat control.* It works because it avoids the mixing of organic matter into the soil where the gnat larvae can feed on it. If the percentage of decaying organic material in the soil is low enough, the gnat larvae simply do not develop into adult gnats.

Extensive research has been done on using weed oil sprays to establish and maintain non-cultivated orchards. The coastal citrus areas have gone over almost completely to this method and several orchards have been using this method here in Coachella Valley for several years. It is clearly an excellent cultural method.

Incidentally, I would like to point out that shredding the leaves and putting them back on the soil surface to form a mulch does not produce gnats. It is fortunate that citrus, which is our largest gnat producer, and dates, which are probably our second largest gnat producer are the two crops that are most easily put into non-cultivation. As a gnat control measure, the district is supplying the weed oil and spraying the middles in citrus and date orchards until such time as the weeds are under control. This is usually for one year. It is up to the farmer to get his orchard ready for non-cultivation, to supply the tank for the weed oil, and to spray the borders and do the detail work around trees. After the weeds are under control, the orchard is to be maintained in non-cultivation by the farmer.

The district has been able to spray the middles in date gardens for about $3.50 per acre, and where nut grass is not present, 4 sprayings will often get control. The farmer's preparation of his land is an important part of this program since the soil should not be disturbed after this non-cultivation program is under way. Only the weed seeds in the upper inch or so of soil will sprout, and be killed by the oil spray. Those below this level will remain viable for 50 to 75 years, so that if the soil is disturbed, some of these seeds will be brought near to the surface and sprout and have to be killed by more spraying. Once a date garden is established in non-cultivation the farmer will only have to spot spray to kill any weeds that show up as a result of seed being brought into the date garden by irrigation water, wind, vehicles, birds, etc. This spot spraying costs only a small portion of the usual cost of cultivating.

Some other advantages of non-cultivation are:

(1) Irrigation is simplified.

(2) Gopher control is easier.

(3) Mite or red spider damage is reduced.

(4) Dried fruit beetle infestation is reduced.

(5) Soil tilth and water penetration are improved.

(6) The vigor of the palms is improved.

One of the things that has most impressed me is the improvement in the growth of the palms. Where we have gone into non-cultivation, since last June, there is now a decided increase in the length of the leaves. A few days ago I measured the length of the leaves at the level of the new crop of fruit bunches and at the level of last years fruit stalks. I did this on Medjool, Barhi, and Zahidi palms. Before non-cultivation the Medjool leaves were about 12 feet long, after a year of non-cultivation they were about 14 feet long—a gain of 2 feet. The Barhi leaves showed a gain of 1½ feet and the Zahidi leaves a gain of 2½ feet. Figuring the gain in leaf area, an average Zahidi leaf had 10 feet of pinnae before non-cultivation or a leaf area of about 23 square feet. After non-cultivation, the leaf of the Zahidi had 12½ feet of pinnae, or a leaf area of 29 square feet, an increase of 26%. Before non-cultivation the trunk was elongating about 18 inches per year, but after non-cultivation the trunk elongated 24 to 30 inches. The increase in leaves was not in direct proportion to the increase in trunk elongation, since the leaf bases were larger, but there certainly appeared to be more leaves. The average number of fruit bunches increased from 12 to about 14 and they appear to be larger, this should account for an increase in fruit production of at least 17%.

As you can see, I've become a strong believer in non-cultivation. I would like to show you a few slides of our date garden under non-cultivation, and after that I hope we can have some comments from other growers who are trying it.

EXPERIMENTAL STORAGE OF DATES IN BULK BINS

By G. L. Rygg

Market Quality Research Division, Agricultural Marketing Service
United States Department of Agriculture
Pomona, California

Bulk bins are becoming increasingly popular for handling and storing various kinds of fruit. Rising costs and decreasing availability of labor have encouraged date growers and packers to consider using bulk bins. If these bins should prove to be satisfactory, they could be used as containers in which to haul dates from the gardens to the packinghouses, and to store the dates prior to final preparation for the market.

Much work has been done in several fruit-producing countries to determine the best bin designs and to design equipment suitable for handling the bins in the field, packinghouse, and storage room (1, 2, 3, 4, 5).

EXPERIMENTAL PROCEDURE

Bulk bins of different sizes and shapes have been devised for use with different crops (3). The experimental bins used for dates were 4 feet square and 44 inches deep. They were divided into four equal sections so that four depths of loading could be tested in each bin. A total of 10 4-compartment bins was used in the present experiment.

The four compartments of each bin were loaded with Deglet Noor dates to a depth of 12, 18 24, and 30 inches, respectively.

Five bins were loaded at the packinghouse of the California Date Growers Association, and five at Valley Date Gardens, Inc., both at Indio, Calif. One bin at each packinghouse was loaded with field run dates having a wide range of moisture contents. The remaining four bins at California Date Growers Association were loaded with dates classified as No. 1 Dry and those at Valley Date Gardens with dates classified as Waxy Tip. The bins with field run dates were stored with other commercial dates outdoors under plastic tarpaulins. The bins at California Date Growers Association was stored 2 months and the one at Valley Date Growers 1 month. Official U. S. Weather Bureau temperatures during the storage period were: Average maximum 73.7°; average minimum 38.0°; highest 95°; lowest; 20°; mean for the period of 2 months 55.8° F.

The bins with No. 1 Dry and Waxy Tip dates were stored at 30° F.

All the dates in the bins examined after as much as 4 months' storage were removed by hand. Dates in the 24- and 30-inch compartments of the bins examined after 8 and 10 months' storage were emptied by turning the bins on their sides to simulate commercial type handling. The dates in the 12- and 24-inch compartments of these bins were removed by hand.

Moisture content of dates were measured on an electrical moisture register.

RESULTS AND DISCUSSION

Field Run Dates

Moisture content of dates at California Date Growers Association was 18 to 23%, at Valley Date Gardens, Inc., 20 to 28%.

All the dates in the 12-inch-deep compartments were loose and readily removed. The dates in the 18-inch compartments at Valley Date Gardens were reasonably loose to about 15 inches from the top but those at the lower 2 to 3 inches were moderately sirupy after 1 month's storage. The sirupy dates contained 24% or more moisture. Dates in the 24-inch and 30-inch compartments were loose down to 15 to 18 inches; dates below this level were increasingly sirupy flattened, and difficult to remove

because they stuck together and to the bin walls and floor.

The field run dates stored 2 months at California Date Growers Association were not quite as moist as those at Valley Date Gardens and withstood deeper loading of the bins. The dates in the 18-inch bin were not sirupy and were reasonably loose to the bottom. Those in the 24-inch and 30-inch bins were satisfactory to about 16 inches. Below this level sirupiness increased and the dates adhered to one another. Dates with more than 20% moisture became sirupy at the lower depths, and were flattened considerably.

No. 1 Dry Dates

Average moisture content was 19%.

Bins of dates were examined at the end of 1, 2, 4, and 8 months' storage.

At the end of 1 month the dates in the 12-, 18-, 24, and 30-inch compartments had settled 1, 2, 2, and 4 inches, respectively. The dates in the two shallower compartments were loose and readily removed by hand. In the deeper compartments the dates more than 20 inches below the surface were increasingly sticky and difficult to remove and separate.

At the end of 2 months' storage the dates in the 12-, 18-, 24-, and 30-inch compartments had settled 1, 1, 2, and 3 inches, respectively. The dates in the 12- and 18-inch compartments were readily removed but those below 20 inches in the deeper bins were sticky and difficult to remove by hand.

At the end of 4 months' storage the conditions were similar to those after 2 months. The dates had settled 1, 1, 3, and 4 inches. The dates in the 12-and 18-inch compartments were readily removed and the bin floors were dry. Dates below the 20-inch depth in the two deeper bins were sticky and difficult to remove by hand, but once freed from the bin, the clumps were readily separated. The dates were not sirupy. The practical depth limit for storing dates at this inspection seemed to be about 18 to 20 inches.

After 8 months' storage the dates had settled 1, 2, 3, and 4 inches in the respective compartments. The dates in the 12- and 18-inch bins were readily removed. Those in the two deeper bins fell free readily when the bin was turned on the side and tilted downward at an angle of about 30° F. Small clusters of 2 to to 4 dates separated readily. The results at this inspection suggests that dates as dry as these could possibly be stored at depths to 30 inches. The presence of occasional more moist dates, however, would introduce handling difficulties by their sirupiness and tendency to form clusters.

WAXY TIP DATES

Average moisture content was 18%.

Bins of dates were examined at the end of 1, 2, 4, and 10 months' storage.

At the end of 1 month the dates in the 12-, 18-, and 24-, and 30-inch deep compartments had settled 1, 2, 3, and 4 inches, respectively. The dates in the two shallower compartments were loose and readily removed by hand. In the deeper compartments the dates at the 18- to 24-inch depth were slightly sirupy. Dates more than 18 to 20 inches below the surface formed a mass that was difficult to separate.

At the end of 2 months the dates in the 12- and 18-inch compartments were readily removed and separated. Dates more than about 16 inches below the surface in the 24- and 30-inch compartments were sticky and formed clusters that were firm and difficult to separate. Dates with moisture contents of 22.6 percent or more became sirupy when 16 to 18 inches or more below the surface.

Results at the end of 4 months' storage were similar to those after 2 months. No additional settling was noted and dates to a depth of about 15 to 18 inches were removed readily. Sirupiness, stickiness, and adherence increased below this level. The more moist dates had flattened considerably. This feature might interfere with mechanical pitting.

The last bin of dates was examined at the end of 10 months' storage. The dates in the 12-, 18-, 24-, and 30-inch compartments had settled 1, 2, 4, and 5 inches, respectively. The dates in the 12-and 18-inch compartments were removed readily. The slight adherence to one another near the bottom of the 18-inch compartment was not serious. The 24- and 30-inch compartments were emptied by turning the bin on its side. Some of the dates below about 15 to 18 inches were sirupy, and the dates below this level adhered to one another, but were separated readily. Sirupy dates and those that flattened appreciably contained 22% or more moisture.

SUMMARY AND CONCLUSIONS

Deglet Noor dates were stored at depths up to 30 inches in bulk bins. Field run dates contained 18 to 28% moisture; the No. 1 Dry had an average moisture content of 19%, and the Waxy Tip 18%.

Dates of each classification were placed in bins to depths of 12, 18, 24, and 30 inches.

Field run dates were stored outdoors under plastic tarpaulins for 1 and 2 months; the ambient temperature ranged from 20° to 95° F.; the average for the period was 55.8°. The No. 1 Dry and Waxy Tip dates were stored from 1 to 10 months at 30°.

Field run dates could be stored satisfactorily to a maximum depth of 15 inches. Occasional moist dates became sirupy at greater depths and caused adjacent dates to stick together.

No. 1 Dry and Waxy Tip dates stored satisfactorily at depths to 18 inches. At greater depths dates with 22% or more moisture became sirupy and tended to form date masses that could interfere with mechanical handling in subsequent handling and and processing operations.

ACKNOWLEDGMENTS

B. J. Peightal, Manager, Date Administrative Committee suggested that this problem be investigated so the information would be available for use in connection with investigations on mechanical harvesting and handling of dates.

Paul Adrian, Agricultural Engineer, U.S.D.A. at Davis Calif., and Roger Perkins, Agricultural Engineer, University of California, Los Angeles, made suggestions on outlining the experimental procedure.

Personnel at California Date Growers Association and Valley Date Gardens, Inc., filled and unloaded the bins, moved the bins about as required, and measured moisture contents of dates. California Date Growers Association and Valley Date Gardens, Inc., provided the dates and bins used in these experiments and stored the dates as required.

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QUALITY OF DEGLET NOOR DATES IN RELATION TO METHOD OF HARVESTING

By Roy W. Nixon[1]

Crops Research Division, Agricultural Research Service,
U. S. Department of Agriculture
U. S. Date Field Station, Indio, California

The effect of method of harvesting on the quality of Deglet Noor dates was studied in 1962 in cooperation with the California Date Growers' Association. Regular picking was compared with mechanical harvesting. In the second method the bunches were cut by a workman in a large metal basket attached to the movable end of the boom of a hydraulic personnel elevator. The bunches were dropped into the metal basket and from time to time as the basket filled it was taken to a trailer into which the bunches were dropped through a trap door in the bottom. The bunches were carried in the trailer to the packing house where dates were removed by a mechanical shaker developed by engineers of the U. S. Department of Agriculture and the University of California. The crop was harvested in two regular pickings and in two rounds of bunch cutting. A bunch was not cut until all the fruit on it was ripe.

The two methods of harvesting were compared in 6 representative date gardens in different parts of Coachella Valley. In each garden 20 uniform palms were selected and these were grouped in 10 2-palm plots which provided 5 randomized replicates of each of the two treatments. Fruit from each plot was harvested separately; from the regular picking it was weighed; from the mechanical harvesting yield was calculated on the basis of 28 lbs. per lug. At the packing house subsamples were taken from each lot and graded according to current commercial standards as top natural, select natural, semidry, No. 1 dry, products, and culls. "Standard dry" of previous seasons was replaced in 1962 by two grades, No. 1 dry and products.

A record was kept of the estimated weight of field culls in the regular picking plots and random samples of this fruit from each plot were graded at the U.S. Date Field Station, as was done the previous year (2). Because entire bunches were cut and the fruit removed at the packing house there were no field culls from mechanical harvesting.

RESULTS AND DISCUSSION

There was no significant difference between regular picking and mechanical harvesting in the average percentages of grades from all six gardens (Table 1). It should be borne in mind, however, that 1962 was a dry season and the fruit was all relatively dry. In a wet season or with softer fruit some of the mechanical harvesting operations might have to be modified to avoid damage to the fruit.

The total yield of fruit delivered to the packing house from the six gardens was 18,956 lbs. for the regular picking and 19,133 lbs. for mechanical harvesting. These figures are close. A greater difference in favor of mechanical harvesting would be expected for all of this fruit went to the packing house whereas in the regular picking there were 1,353 lbs. of field culls, which added to the packing house delivery is 6.7% of the total yield. There may have been some unrecorded loss from mechanical harvesting between palm and packing house, but it is also likely that the estimate of 28 lbs. per lug for the mechanically harvested fruit was slightly lower than the actual weight would have been.

In spite of the fact that all the fruit from mechanical harvesting went to the packing house, the percentage of packing house culls was almost identical with that from regular picking. This is partially explained by the fact brought out in 1961 (2) and again in the regular picking in 1962 that a large proportion of the so-called "field culls" were acually good dates. In this connection, it is to be noted that the percentage of culls from different sources (Table 2) is based on number of fruits in each category, whereas packing house culls are based on weight. Since one good date would ordinarily weigh as much as 2 to 4 shrivelled or unpollinated dates, it is obvious that the percentage of good dates included in the field culls, if calculated by weight, would be much higher, possibly as much as 50% of the total field culls.

The percentage of field culls from the regular picking was slightly lower than the average in 1962 (2) and much less than that in 1960 (1). The percentage of good dates found among field culls in 1962 was within the range of that reported for 1961, but in 1962 there was more shrivel and unpollinated fruit and much less fruit rot and insect damage.

Table 1. Average percentage of different grades of Deglet Noor fruit in relation to method of harvesting in 6 gardens.

Grade	Regular Picking	Mechanical harvesting
Top Natural	2.2	3.3
Select Natural	16.1	13.4
Semidry	28.9	27.3
No. 1 dry	29.2	34.7
Products	19.2	16.8
Culls	4.4	4.6

Table 2. Average percentage by count of field culls of Deglet Noor fruit from different sources in regular picking in 6 gardens.

Source	Culls
Shrivel	31.9
Good fruit	27.6
No pollination	15.3
Immaturity	7.3
Rot	4.4
Bird pecks	3.1
Dirt	2.6
Deformity	1.5
Insect damage	1.2
Other	5.1

SUMMARY

In the dry season of 1962 the percentages of Deglet Noor fruit in the different grades from regular picking and mechanical harvesting were not significantly different.

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[1]*Data from this experiment were analized statistically by E. J. Koch of Biometrical Services, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland, whose cooperation is much appreciated.*

NEW DATE PRODUCTS

Lee and Ruth Anderson
Date Growers and Owners, Covalda Date Company
Coachella

The present marketing order which requires a "set aside" of approximately one third of our Deglet Noor dates creates a serious problem to the date marketing organizations. Not only must new products be created and manufactured but packers must also build up markets for them.

Covalda Date Company has developed several new products and found more ways of using many of the older products made from these restricted dates. Following is a partial list of new developments being displayed:

"Datettes" are a chopped, pitted date. They are on the market under such names as "Crunchies," "Redidate", etc., and are a great boon to the housewife, baker, or manufacturer of candies. The makers of "Date Nut Delight", who use the Datettes, are pleased with their finished product, and report growing popularity for it. Datettes are also made into an unfired fruit cake for those who prefer unheated food. A small slice is a meal in itself.

"Date Coconut Roll," which can be made from Datettes or macerated dates, is a product which has been available for some time. We also make a bite-size date and coconut confection called "Datelets". This product is popular with children whose sweet tooth must be satisfied. They are also tasty in salads or puddings. Also, a new use is enrobing these Datelets in a chocolate, soya-chocolate or carob coating.

The product "Date Butter" or "Creamed Dates" has been on the market for many years. It is excellent used for date shakes, ice cream topping, in baking or on sandwiches.

Grinding the bone-dry date gives us "Date Sugar" and "Date Granules". Date Sugar is combined with herbs by the makers of "Yerba Enchanta". It is also used in the breakfast food called "Vim". Date Granules are added to coconut and soya grits to make a breakfast food.
"Whole Date Sugar" is made by grinding the dates and pit in a powerful machine using the freeze method. There is no enzyme loss because of heat which would ordinarily be generated in the grinding process. The hormone found in the seed is reported to be more compatible with the human body than others so far discovered. This same product is also combined with coconut butter to make a chocolate-like candy sold under the trade name of Choco-Date. It can be tolerated by people with a chocolate allergy.

"Date Chips" are also made from the bone-dry dates. They are broken into irregular pieces and allowed to dissolve in the mouth, in the same manner as hard candy. These are a source of quick energy, ideal for camping, hiking, pack trips, etc., because they are light in weight and are a concentrated food.

The date industry is faced with moving a larger amount of these dates each year. Products have taken over some of the previous whole date market. The housewife who formerly bought a package of whole dates for cooking, may now purchase them already chopped. It is to be hoped that more dates are used because of this convenience, but no study has been made to give the industry a means of estimating the program.

Refreshments served those attending the Institute consisted of Datelets, Unfired Fruit Cake, Date Nut Delight, and Coffee.

Date Growers Institute - 1963 Membership

(As of September 1, 1963)

SUSTAINING MEMBERSHIPS

Allah Date Gardens	Indio
Thomas R. Brown	Thermal
H. L. Cavanaugh	Palm Desert
E. L. Christian	Indio
Coachella Valley Ginning Company	Thermal
Date Administrative Committee	Indio
Dr. J. R. Furr	Indio
Robbins Russel	Thermal
Shields Date Gardens	Indio
Leonhardt Swingle	Indio

REGULAR MEMBERSHIPS

Burnham Adams	Playa del Rey
Adohr Farms	Mecca
Sarah M. Allen	Indio
Earl Asker	Indio
J. D. Babbage	Riverside
L. S. Barnes Estate	Long Beach
Baza Ventura, Inc.	Cathedral City
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Bedford-Jones c/o Harry Bissell	Miami, Florida
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Louis H. Boyar	Beverly Hills
Alberto Breyer	Buenos Aires, Argentine
Roderick Burnham	Idyllwild
Steve Burton	La Verne
California Date Growers' Assn.	Indio
Cameron & Powell—D&J Ranch	Coachella
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The Dates Officer — Somali Republic, Africa
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W. L. Dixon Co., c/o Pete Dondero — Indio
A. P. Downing — Brewton, Alabama
D. D. Dunlap — Thermal
Ivan Eastes — Indio
Eastslope Ranch — Palm Desert
Dick & Edith Edwards — Palm Springs
Harold Elmer — Riverside
El Mima Date Garden — Alice Springs, N.T. Australia
Tom W. Embleton — Riverside
Esel C. Eoff — Newport Beach
Fair Acres, c/o David Mitchell — Indio
Homer Fetty — Thermal
Mariana H. Fields — Rancho Mirage
Pauline Findeisen — Palm Springs
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Chris Frank — Coachella
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Erle Stanley Gardner — Desert Hot Springs
Mildred L. Garner — Sherman Oaks
Montie Gayler — Thermal
Elton Gebhardt — Thermal
H. L. Gee — Beverly Hills
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John Gibbs — Greenwich, Connecticut
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Norvel Jarvis — Thermal
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Ronald Johnson — Thermal
Art Jones, c/o Casey Van Voorst — Thermal
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Kennedy Bros. — Indio
Joe Kitagawa — Thermal
Konjoyan Bros. — Thermal
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Ben Laflin, Jr. — Thermal
Ben Laflin, Sr. — Thermal
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Leon W. Lauderbach — Tustin
K. K. Larson—J-J Citrus Ranch — Palm Springs
George Leach — Thermal
Leslie Ranches Nurseries — Indio
Dr. David Lindgren — Riverside
Dr. E. G. Longley — Long Beach
Karl Lundberg—Gold Acres — Pasadena
Dr. Vincent P. Maier — Pasadena
Donald Marxs — Cathedral City
Marshburn Farms — Thermal
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R. C. McCurdy — New Yory, N. Y.
Dr. John McGonigle—Lazy Acres — Pacific Palisades
Norman McLeod — Palm Springs
John A Michelson — Palm Springs
Don H. Mitchell — Indio
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Ronald E. Moran — Cathedral City
Nick T. Moschetti — Rancho Mirage
Arthur B. Muhs — Davenport, Iowa
Dr. O. M. Naranjo — Los Angeles
Mrs. Lyle C. Newcomer — San Marino
Willis Newsom—N & N Ranch — Anaheim
Roy W. Nixon — Indio
Vernon Nussbaum—American Date Garden — Brea
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Floyd W. Odlum — Indio
Kay Oleson — Palm Desert
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K. K. Patterson — Indio
James L. Payne — Indio
Peter Rabbit Farms — Coachella
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Prairie Ave. Gospel Center — Hawthorne
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J. Harold Puls — Palm Desert
Walter Pulsifer — Salton City
K. W. Ranney—F & R Ranch — Santa Ana
Joseph Rapkin — Milwaukee, Wis.
Dr. Walter Reuther — Riverside
H. C. Richert — Indio
Marie L. Robertson — Cathedral City
Donald Robinson — Indio
LaVelle Robison — Sacramento
David Rogers — Winterhaven
Will D. Rudd — San Diego
E. D. Rudy — Indio
Rummonds Bros. — Thermal
Russel & Alexander — Thermal
William M. Ryals — Palm Desert
Dr. G. L. Rygg — Pomona
S & H Farms, c/o Donald E. Wilson — Indio

Tom Sakai ..... Indio
A. Naguib El Sawal ..... Riverside
William Dey Schafer ..... Los Alamos, New Mexico
Henry M. Scmid ..... Coachella
Thomas Schmid ..... Coachella
Walter Schmid ..... Garden Grove
Martin Schwartzburd ..... Studio City
A. E. Siegal ..... Thermal
Fred Siemen ..... Palm Desert
E. C. Simmons ..... Indio
Jackson W. Smart ..... Chicago, Ill.
George B. Smigel ..... Los Angeles
Ed Smith ..... Indio
Dr. Rodney H. Snow ..... Santa Monica
Edward C. Stock ..... Thermal
Joseph Strehle ..... Longview, Wash.
Mrs. Walter T. Swingle ..... San Francisco
Tamarisk Golf Club, Inc. ..... Palm Springs
Lawrence G. Thielemeir ..... Santa Ana
Bradley & Agnes Thompson ..... Indio
Thunderbird Park, Inc. ..... Cathedral City
U. S. Date Field Station ..... Indio
W. E. Urick Ranch ..... Los Angeles
Bernard H. van der Steen ..... Indio
Dr. Joseph Walker ..... Glendale
Norman A. Waters ..... Chicago, Illinois
Webb Farms, Inc. ..... Thermal
Robert W. Webb, Jr. ..... Palm Springs
Dr. Aaron Weiner ..... Indio
James P. Westerfield ..... Mecca
The Western Province Fruit Research ..... Stellenborch, South Africa
Hollis L. White ..... Rancho Mirage
Gwynn Wilson ..... Palm Desert
George Woodbury ..... Indio
Zapp-Grandy, c/o G. C. Grandy ..... Vancouver, Wash.
Stanley & Selma Zarakov ..... Palm Springs